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A peek into the future at a broad new concept of administration which eliminates weaknesses of the past.

The Philosophy of Integrated

A paper Presented at the April 1956 meeting, Keystone Chapter, SPA.

► In industry, data processing is not an end unto itself. Even if data processing were to become more integrated than heretofore, it would still not be an end unto itself. Industry does not manufacture and sell data. It manufactures and sells products. In the process, it develops data which are used in controlling the future of its production and sales activities. Data processing is an industrial by-product which is useful, yes *necessary*, in the management of industry. Its purpose is to keep management posted as to where they now stand so that they can determine where they are to go. Its primary purpose is not to tell management where they have been. It is for the future, not for the past.

Processing great masses of industrial data is slow. It takes time to gather it from its scattered sources. It takes further time to transcribe and summarize it, whether manually or with existing machines. The sale of a single refrigerator by a firm that manufactures and sells refrigerators all over the country, has significance only after it has been totalled with all the other single refrigerators that were sold at the same time. The process of gathering all those sales data and summarizing them takes excessive time under existing methods. By the time the summarized total figure becomes available for review the sales pattern has changed and the figure is history. It is dead. This is true of all industrial data—customer order statistics, sales (shipments—invoices), inventory status (whether raw material, work-in-process or finished goods in main plant or nationally scattered warehouses), accounts receivable, payroll, etc.

To date, the existence of such timing influences has been solved solely by the technique of accumulating data by periods —daily, weekly, monthly, quarterly, yearly. This is merely an expedient to insure some degree of certainty in the summarization of data. If all the company's national sales offices "close" their sales as of 5 p.m. Friday each week, there is a reasonable assurance that the sales data gathered and summarized at headquarters the following week will tell us what we sold of each product throughout the prior week, from Monday through Friday. It will give assurance that none of the following week's sales get into the statistics to foul up our daily average rate of sales. So, if we must wait until Wednesday evening of the following week to obtain our total figures, we have by this

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by Alan O. Mann

Data Processing

technique automatically excluded the data we most desire, i.e., the rate of sales for the Monday, Tuesday and Wednesday required to gather and summarize the data.

Industry has also developed a practice which has further impact on the use of data. This is the system of check and counter-check that runs companion to the "closing" of records. It is at the heart of accountancy. It accounts for every last penny in all the transactions involved in a closed period. It concentrates on bookkeeping—on balancing the books, a process which eats up time while the physical flows of production, sales and inventory go on uninterrupted. In effect, it contributes to undue delays in obtaining information necessary for decisions of physical readjustment. It is literally true that while we are hunting for the last few pennies of data reconciliation, we are pouring out thousands of dollars of cost or losing thousands of dollars of sales because we are without any timely data whatsoever. We have lost a proper sense of proportion between our demands for bookkeeping accuracy and the immeasurable inaccuracy of periodically undirected industrial activity.

A further characteristic of industrial data rests in another expediency. The manufacture of products generates and requires data that deal with physical units of measure—pounds, yards, gallons, pieces, categorized in accordance with the physical requirements of various machines for producing various sizes and types of products. The sale of products generates and requires data that deal with similar physical units of measures—lots, assemblies, pounds, pieces, etc., but categorized in accordance with market sub-divisions or customer buying patterns. The financial handling of data deals with dollar evaluations of the other physical data, categorized into bookkeeping groups on costs of manufacturing, prices of sales and cost evaluations of inventory. Because of the enormity and variety of the total data just outlined, industry has adopted the expediency of subdividing our operations and assigning the different data interests to the various divisions—quantities and costs to manufacturing, prices to sales, and compartmentalized bookkeeping on all costs and prices to accounting.

It is apparent, then, that it is these characteristics of industrial data that lead us to seek *integration*. It is these factors which make us conclude that our data processing is not yet integrated. Our data is not sufficiently timely. It is periodic even though our actual operations are not. We hunt for pennies while thereby expending dollars. Our data is arbitrarily compartmentalized —even though it needs to be unitized to fulfill our company's avowed single purpose of manufacturing and selling its products at a profit. Herein lie the needs for *integrated* data processing.

This leads us logically to the true purposes of integrated data processing. Even though we have recognized the needs and might conceivably work out the means of filling the needs, we cannot fully do the job without first developing the true purposes for so filling the needs. What is it that we are trying to accomplish for the customers, employees, stockholders and management?

First and foremost it should be our purpose to change the nature of work we now require of human beings who handle data

Continued

for planning and control. A major portion of the work performed by some eleven million clerical workers in the United States is not befitting the dignity and intellect of human beings. It is depressive that so many whom God made "but little less than the angels and crowned with glory" must spend a major portion of their lives in strictly mechanical work. We have built into our operations endless repetitive, tedious monotonies of sorting, filing, collating, copying, matching, key punching. These are functions that belong to the tools man can contrive, not to man himself.

Even at supervisory and managerial level we have developed corresponding unworthy techniques. We have acquired through habit a strong concept of managers' mental functions. We assume a constant use of experience and judgment in their managerial decision-making. In reality, a major portion of their decisions apply to repetitive circumstances and are made with the use of repetitive arithmetical calculations at grammar school level, performed mentally. Even here are strong elements of machine work done by man.

Our first purpose of integration is hence to develop machines and techniques that will transfer mechanical work to machines and make man's work for man.

As we pointed out earlier, *time* is the greatest obstacle to our planning and control of business and industry. To date, we have not successfully kept the modulations of our information in time or in tune with the modulations of our physical operations. All of our physical activities run in cycles of rise and fall, whether they be sales, production, procurement, inventory or employment. Our information concerning these activities always reflects the same cycles but *follows* them in timing. Our decisions are based largely on such information and, due to time lags and lapses, largely run contra-cycle to the physical situations, causing physical adjustments that run contra-cycle to actual demands. Hence, we push production up when we ought to be levelling off, or we continue to drive production down when we ought to be turning it up, or we most strenuously attempt inventory reduction when we should have begun to build it up, etc.

Twin pathologies confront us in this matter of timing, namely, time lags and time lapses. Time lags arise from limitations in equipments and methods of communication, recording and computation. The composites of mail time, messenger time, sorting, matching, recording, summarizing and re-transcribing, all add up to a total expenditure of time that we describe as "lag." On the other hand, because of "lag" we chop time up into periods as I described earlier. At the close of each period we bow to the inevitable companion of "lag" and wait expectantly during an added period of time for the resultant information. Here, then, is the "time lapse" during which we are without needed information. The "lapse" is the period of waiting while information that has already lagged is assimilated into reports and statistical exhibits.

Our second purpose of integration is hence the elimination or reduction of time lags and time lapses. We must fight time. We must increase speed.

Nearly synonymous with the element of time lag and lapse is the element of inaccuracy. In effect, while we have been making these earlier comments on timing, we have incidentally been describing inaccuracy. In baseball, a batter whose timing is bad strikes out. He is not accurate. In business and industry, late information, dead data and tardy decisions cannot produce accurate actions any more than the strike-out can produce runs. Even though the data may be cross-checked down to the last piece or penny of balance, as long as it has application only to a "then" it cannot be an *accurate* determinant of "now." Merely the absence of information is, in it-

self, inaccuracy. A statement that ten radios are in a warehouse is not accurate if one, two or all ten were shipped two days ago. It is no more accurate than to say that we don't know how many radios are in the warehouse. Yet, this is a simple example of the manner in which we handle data today. When we ship a load of twenty motors from our factory to a distant warehouse, we immediately say the twenty motors are in the distant warehouse even though it will take two weeks for them to get there. We then analyze the sales at the distant office and question why they haven't shipped (sold) to their customers the motors they haven't even received to ship. Our facts and our analyses are not accurate because they are untimely.

There is another element of accuracy that confronts us today, as a result of the size and complexity of our business operations. In any sizable organization, the number of operations that have to be performed in the handling of a primary transaction is staggering. The supposedly simple processing of a single customer's order involves editing, credit check, verification of specifications, pricing, inclusion of the order in sales, financial and production planning statistics, assignment of the products from factory or finished stock, pulling of the material from stock, packaging, packing, shipping, invoicing. By the time the customer receives his material and his bill, the order has passed through scores of operations and dozens of hands in several departments of three or more divisions of a company's organization. Existing procedures involve transcription, random routings and much division of labor. It is practically an impossibility to assure completely correct and timely action on the part of every participant in the process.

Hence, another purpose of integration is the development of improved accuracy.

Fourth in our list of purposes is the improvement of decision-making at all levels. Decisions to be sound must be based on facts and the facts must be current, accurate and complete. In the process of establishing improved control of time and attaining greater accuracy we will also provide the wherewithal for improved decisions.

We forecast future demand largely through arithmetical calculations. On the basis of our forecasts we calculate personnel, equipment and raw material requirements. On the basis of our forecasts we make calculations from which we establish policies on levels of manufacturing operations, programs for capital expansion or contraction, financial plans, yes, on nearly everything that is of a policy nature in our business.

Yet, because most of our managerial personnel at all levels have not concentrated on training in advanced mathematics, these calculations are usually made with grammar school arithmetic or the simplest elements of algebra. It becomes increasingly apparent, from the recent work of a few

Continued

advanced mathematicians and outstanding men in the fields of the pure sciences, that these present calculations are but a shoddy makeshift, a substitute for the more effective computations that could be made for arriving at sounder decisions. Added to the research findings of these men is the significant fact that electronic equipments are being developed to make the more elaborate and time-consuming computations more accurately and in less time than the current calculations. We are discovering that much of our managerial decision-making is a more scientific activity than we have heretofore realized.

It is hence our fourth purpose to develop and use more advanced computational techniques and equipments for the improvement of managerial decisions, all the way from the lowest supervisor to the chief executive officer.

Our next purpose is the elimination of wastes from our industrial operations. Everything we have talked about thus far has involved some kind of loss of resource. The list is endless—loss of brain-power during unnecessary clerical activities, the loss of time before we can take effective action, the wastes that arise out of inaccuracy, waste floor space used by excessive clerical forces, the wastes of raw material pulled out of our natural resources to sit on shelves and cushion our untimely and inaccurate decisions, similarly created wastes of work-in-process and finished stock inventories, the wastes of paper forms and records now used to maintain our industrial operations, the wastes of brainpower and energy expended on politics in segregated and functionalized organizations, the wastes of our "boom" or "bust" cycles of employment and unemployment, want and plenty, prosperity and depression. All of these wastes are directly related to our present techniques of administering our business and industrial enterprise.

So our fifth purpose is to eliminate, or reduce to the greatest extent possible, all our current wastes.

Our next purpose obviously can be fulfilled to the extent that we fulfill the earlier ones. It requires no explanation. Our sixth purpose is to bring supply more nearly in line with demand, to give better service to our customers.

And of course all of this will boil down in the end to a final purpose of reducing costs. I have intentionally placed this purpose last to emphasize the point that our first efforts should be directed less at the reduction of monetary costs than at any others of our goals. This is despite the fact that substantial progress towards all our other purposes will incidentally accomplish wonders in the reduction of costs. But this is only if we refuse to tackle our problems on a first and foremost basis of immediately reducing costs. Unless we so refuse, we cannot fully succeed, for what may initially seem the cheapest may ultimately prove to be the most costly. There is no deterrent to industrial progress stronger than a preconceived opinion of costs based on our existing concept of operation.

Other Purposes

Inherent in this last or seventh purpose is the need for finding the equipment to fulfill the other purposes. It is our intent, not merely to find new applications for existing equipments but to develop and modify equipments until *all* the other goals are solved. In the process, we may rest assured, costs will be radically reduced.

The final equipments ultimately will be a composite that will knit together the functions of high-speed automatic communication, massive data storage and both simple and complex computation. They will separate out the mechanical from human work, eliminate time lags and lapses, provide new and undreamt-of accuracies, establish wherewithal for sounder decisions, eliminate wastes and serve customers better.

From these statements of purpose it can be seen that we have expanded our views of integrated data processing. We have dug far deeper than the mere processing of data. We have gotten right into the heart of business and industry. We are seeking a new concept of administration that eliminates the weaknesses of the past. We will, as we are able, replace past concepts of organization, accountancy, periodicity of statistics and reports, managerial decision-making, time and accuracy. Hence, we conclude that what we are after is not just integration of data processing, but of administration itself. Our concept is not one of integrated data processing but of integrated administration, aided and abetted by new techniques in the handling of facts.

Very briefly, our new techniques hinge on the application of two sets of equipment, namely teletypewriter or similar wire communications *and* electronic storage and computational equipment. These two sets of equipment go hand in hand. In my opinion neither one by itself provides the real solution to our problems. Together they will solve them thoroughly and with startling results beyond those popularly but wrongly claimed for only elements of the equipment.

The teletype communications will cover all major transaction points in the company, both locally and nationally. The circuitry will be over privately leased facilities, not public. The entire system will be automatically switched into and through one or more master switching centers.

Proper engineering and application of these equipments is extremely significant to us. We now have new capabilities. For the first time in history we can and will accomplish all these things:

a. We need never write down an item of information more than once—the first time at source.

b. We can eliminate all transcribed (copied and summarized) records, cards, ledgers, punched cards, etc.

c. We can eliminate all present manual and machine summarizations with their undesirable elements we outlined earlier (untimeliness, periodicity, slow balancing and compartmentalization).

d. We can provide direct, immediate access to summarized facts and their detailed supporting data, *upon demand.*

e. We can provide *current* data, not *dead* data, upon demand.

f. We can consolidate quantitative and dollarwise facts in one recording and one reporting, so that physical facts can be constantly evaluated and fiscal facts can be interpreted physically.

g. We can transfer mathematical portions of our decision-making from the administrator to machines, so that the administrator can concentrate more on the truly administrative decision-making.

h. We can radically reduce the time lags and lapses in all areas of recording, reporting, communication, computation and decision-making.

And now, I will simply state my conviction on each of a number of controversial issues that are in the forefront of today's interest:

a. Our future lies largely in "in-line" data processing. "Batch" processing will disappear. The only exception I can think of is payroll, where we will probably never want to pay employees minute to minute.

b. Sorting and sequential filing will dwindle rapidly and become a practice only for long-term legal documentation. Our future will lie largely in random storage with direct, high-speed access.

c. Pre-programming of data handling will

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Making top management aware of the benefits derived from a systems group is a most important part of systems work.

How to Sell Systems to

A Speech given at the Fifth Annual Systems and Procedures Conference in San Francisco, April, 1956

► The word "selling" is one of the most overworked expressions of the day. It has a meaning, when used in relation to top management, which may be misleading; however, if the word "selling" means to you making management aware of the benefits derived from having a systems group on the staff, then we do have a good point at which we can start.

This word "selling" is used to denote that intangible something or other which most of us wish could be spelled out as part of an exact formula, or series of program steps, into which you could merely fit the known values for your company and thereby arrive at the precise approach to use on your management. Unfortunately, no such thing is possible, for there is no formula. To check this, I made a tour of several companies in the area to see if they had found the secret formula. Each organization was different; each had its own way of keeping top management informed; each had personalities in the top management which had to be taken into consideration; and yet out of it all there was one common ingredient which all agreed was important in the relationship with top management. That one consistent ingredient was *results*. The second most consistent factor found common to all organizations was *reports* to top management. Briefly stated, results are the things which top management can see for themselves, and reports help to bring to their attention things which may not be self-evident.

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Any reputable firm must have a good product to sell if they hope to retain their steady customers. That parallels our case, for our good product under discussion here is technical competence, ability to maintain proper relationships with the operating departments, winning of confidence, ability to dig into all aspects of systems problems to come up with an improvement after careful study, and so forth. This is the product we have to sell and it better be good or our customers, top management and the operating groups, will soon discover for themselves that they are not getting the improvement they expected.

Whenever the subject of selling comes up, it also brings up the matter of overselling. A management which has been

by Robert Briggs

Management

burned by an over-sold product will be very skeptical about putting themselves into a position of being burned the second time. An extreme example of overselling would be to give top management the impression that a systems group will produce miracles overnight without much additional cost. Most of us know that good systems studies take time, most medium or large systems changes cost money and create confusion during the transition. Management must be apprised of these things in advance or they are going to be surprised and bitter when these obvious facts eventually come to light. The old adage: "Make haste slowly" is a good one, for it is far better to have the system over-planned than it is to have it over-sold.

And then there is the other extreme. The fortunate management which has always had a very competent systems unit as part of its staff and doesn't have to be sold.

In order to obtain the best results, it is important that we look further into the systems group relationship with top management. The staff members must understand the nature of their task. Theirs is not only a matter of generating sound ideas through a skilled technical approach to problems, it is just as important that they gain the acceptance of all who will be affected by putting the system or change into action. The planning must be solid, technically good, and take care of some of the more important exceptions to the normal routines. One quotation which is appropriate at this point is, "The procedures analysts must remember they are assistants to the line executive; that their staff exists to supplement him, not to create more problems for him." There is a great deal of fine material published on this phase of systems work so it is not necessary to go into further detail here.

Management's Part

So far we have talked about the system group's responsibility to top management. This is not a one-way street. Management has an obligation to the systems group also. Efficiency, coordination, and control begin with top management's desire to have such things. They are an attitude of mind which top managements must not only adopt consciously but must transmit consistently to all other levels of management. Without this feeling on the part of the management, systems work is like a salmon trying to swim upstream over man-made obstacles. Management interest must be sustaining. For example, if the systems staff must work at long periods of time on a project without being in communication with the top management, and

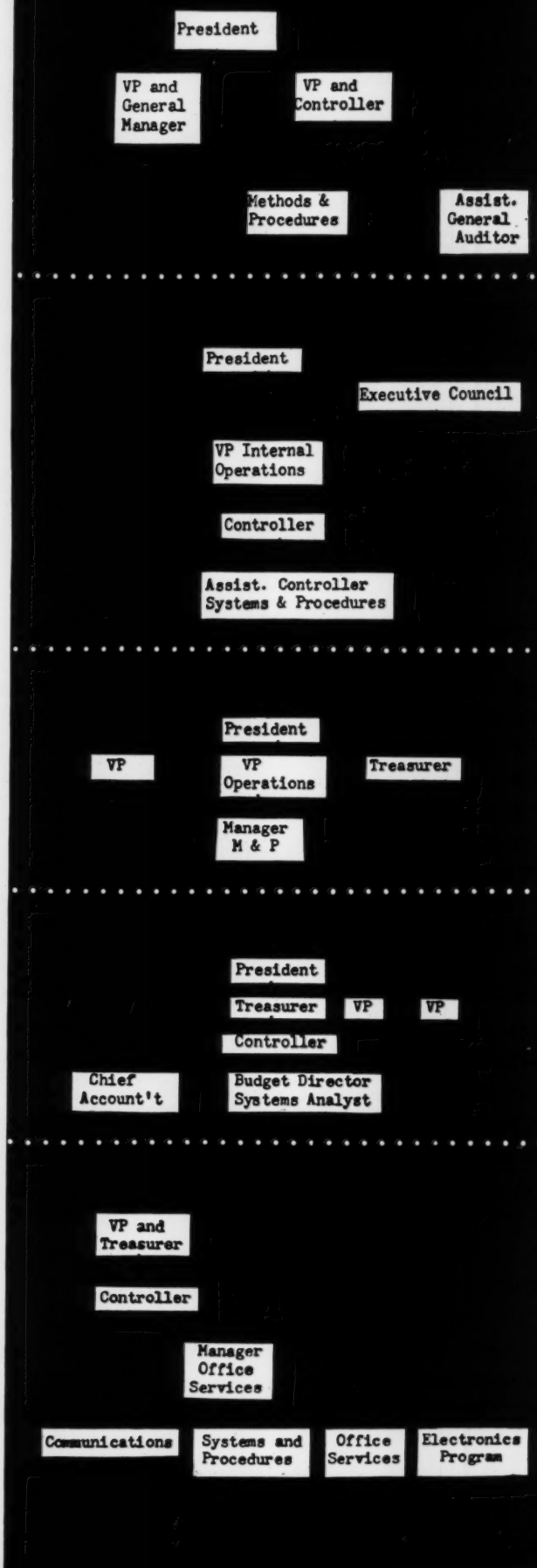
Continued

if management's initial interest and enthusiasm toward the program are soon lost, then it is not long before the other executives may well feel that the systems group has lost the endorsement of top management. It is management's responsibility to be sufficiently serious about systems work to hold to its long-range plans, otherwise such an undertaking should never be started. If a program is started and abandoned within a short time for lack of spectacular results, it will do the entire organization more harm than good. In short, management must support a systems program if it is going to launch into one. However, systems people must warrant this support, but this is a sufficiently important point that we can restate it: This is a two-way responsibility.

The top management in any organization differs with each company. No doubt each one of you has a good idea of where the top management is located in the organizational structure of your company. Through what channels the systems group must go to reach top management depends upon where in the organizational chart the systems group is hung. The case studies mentioned earlier were very interesting in this respect, for this is one of the reasons why each group must sell, or maintain, its relationship with top management in a different manner. Abbreviated sketches of portions of these organizational charts for a few of the companies visited follow:

What kind of reports should the systems group make to top management? The word "report" is another one of those broad terms which has many meanings, but in this discussion it means to advise, to sell, and to otherwise maintain a channel of communication with the management. Well, discussion with various companies disclosed as many answers to this as there are variations to the organization charts.

Company A finds that it can best keep the superior officer, a Vice President and



Controller, currently informed by verbal reports as the occasion demands. They write a report when any major project is completed to focus attention primarily on the dollar savings accomplished. In Company A they perform procedure audits in the field to verify that their vital internal checks are being maintained. Any local variations to the established procedures are discussed with the local management and covered in an audit report to top management.

Company B, which is a large organization with far-flung operations, has a top management which is systems-minded because it was awakened a few years ago to the necessity of uniformity and better control. They report currently on a more or less informal basis by medium of carbon copies of letters, verbal directions, and discussions. A semi-annual report summarizing the status of the projects in progress is prepared for the information of all levels of management. Recommendations flow from the Systems and Procedures Department, headed by an Assistant Controller to the Controller, then up to a Vice President of Internal Operations, and finally to an Executive Council and the President.

Company C is very interesting because here all formal internal communications regarding policy are prepared by the systems group. Further, like Company A, they do field audits to check on the application of company policies. This is a very active group and their operations cover many line functions not usually found in a systems group which is a staff function only, in most organizations. The quarterly and annual project reports they prepare are very detailed and comprehensive. A simple weekly statement is also prepared to keep the superior officer currently informed.

Company D is smaller than the other three just mentioned. Here the man charged with the systems responsibility has other operating functions so reporting does not become so important in this instance. When major changes are planned, his group prepares recommendations as part of a formal report which is forwarded to the Controller, then up to the Treasurer, and finally to the President for approval of funds.

Company E has very extensive operations and employs a great many people, yet the Systems and Procedures Section does not prepare current reports except for recommendations to management on major projects. Most of their projects are initiated by requests from other operating departments so the procedures section is used by management as a very useful tool to carry out and inaugurate necessary procedure changes and improvements.

Keeping in Touch

To sum up this reporting function, it is a significant one even though each organization may approach it in a different manner. This reporting becomes increasingly significant if many of the larger projects are "in the mill" for a considerable period of time before reaching a stage of completion suitable for discussion with the top executives. Obvious effort must be exerted, by management and the systems group, to keep in touch with each other.

There are many other ways in which management can be kept informed regarding the systems picture in general. One of the best ways is to get them to attend professional meetings; another is to send them clippings or articles of specific interest; and still another is to get them to visit other companies.

In conclusion, if top management is continuously advised of the progress by *reporting*, whether it be formal or informal, written or verbal, and observes the *results* in tangible form of smooth running operations —then your selling job will eventually result in management being sold on continuing the improvements.

Make forms functional and attractive; review them regularly to see where savings can be made.

Better Forms

► One of the activities in which a competent Systems and Procedures Department renders yeoman service is forms control. The forms man has to take both a large and a small view of the company's clerical operations. In the large view he is striving to provide the company with an integrated set of essential forms for each recognized activity. In the small view he is scrutinizing the physical aspects of every form to see how many dollars he can squeeze out of the cost without impairing their efficacy. This portion of the forms man's work should never obscure his larger purpose, but neither should it be neglected.

In this respect one may liken the forms control section of a large company to a mill into whose hopper are fed half a dozen or so forms every day for review. Out of the mill come professional designs of new forms and redesigns of existing forms which are for the most part cheaper and better than the items that went into the hopper.

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If the company has a running balance of about 1,200 forms, then a review at the rate of six a day will cover the field in a year's time. Of the forms reviewed, perhaps ten a month will be selected for possible redesign to achieve savings in preparation time or purchase cost, or to make adjustments required by procedural changes. The savings on purchase cost should amount to at least $5,000 a year every year. Sometimes a saving looks startling, such as one in which the cost of a tool repair tag form was reduced from $62 to $19.56 per M, but the form was used only at the rate of 1,500 a year so the annual saving amounted to but $63.66. On the other hand a modest price reduction from $12.06 to $10.91 per M on a continuous tabulating form used at the rate of a million sets a year resulted in an annual saving of $1,115—more than one-fifth of our savings goal for the year. In some years when we pick up a few items like this we can boost our annual savings as high as $10,000.

Some of our favorite ways of squeezing out savings or otherwise carrying out our forms control activity are recounted in hopes that the reader may find one or two useful bits of information.

One of the brightest spots of our program has been our success in controlling and redesigning the tracing forms used by the engineers. All five of our engineering

by Gibbs Myers

departments have settled on one set of standard size forms in a minimum of designs. All standard sizes are in multiples of 8½" x 11" so that resulting blueprints may be folded to fit letter-size files. Only 2 sizes of tracing forms are actually printed with the conventional borders, title blocks and tolerance blocks—these are the 8½" x 11" and the 11" x 17" sizes. To provide the draftsmen with sizes larger than 11" x 17" we furnish unprinted tracing paper cut to correct size, together with separate title blocks and tolerance blocks having built-in adhesive for attaching to the tracing paper in the proper spots. All the draftsman then has to do is rule the border. The reasons for this change from our previous practice of stocking tracing forms in a variety of sizes up to 44" x 34" were that the larger sizes of paper were slow and costly to print, clumsy to handle in the stockroom and subject to excessive shelf wear. The savings in printing costs run close to $1,000 every year.

On all types of forms it's good advice to limit the size to 8½" x 11" if possible. This size is economical to print, stock, process and file. Anything larger results in higher costs, slower deliveries, more shelf wear, more costly handling and bulkier filing equipment. Sizes smaller than 8½" x 11" should be used by all means wherever they are adequate. Good results have been obtained by reducing the size of 8½" x 5½" forms to 7" x 4¼". In a surprisingly high percentage of cases the smaller size gives enough space for the information previously printed on the larger size, and the cost is about 20% less. Whenever sizes larger than 8½" x 11" are required, you can go as far as 11" x 17" but should fight tenaciously against anything bigger. It's especially important to avoid odd sizes that are difficult or expensive for the printer to handle. If you don't, the results to you will be fewer available sources, higher prices and slow deliveries.

As to the number of parts, their colors and sequence, here are a few pointers. First, provide as many copies as are genuinely needed provided they can be legibly handwritten or machine-written, as the case may be. Don't, of course, add copies if an existing copy can be routed, but don't on the other hand distort or delay operations just to eliminate a copy—however, by all means specify that any information copies (as opposed to record copies) are to go into the waste basket as soon as they have served their purpose. A good color sequence is white, canary, pink, goldenrod and green, since many printers make gang runs of this arrangement and can give you a cheaper price. I used to shy at changing the Accounts Payable copy, for example, from white to pink or vice versa for fear of upsetting people no end, but experience has shown that color changes, if not manipulated irresponsibly, are usually accepted stoically by the supervisor and taken in stride by the clerks.

Do, if possible, arrange the sequence of parts so that any copies removed prior to final distribution of the parts of a snapout are pulled from the inside copies so as to avoid the need for tearing loose carbons off the back of the form. Sometimes the part to be pulled first can be extended beyond the others at no extra cost. Little features like this can usually be had for a flat charge on a complete run. This means that if you are ordering a large quantity the

Continued

cost is spread so thinly that it amounts to only a few cents per thousand.

Money can be saved on tag forms by reducing the size to the minimum standard and by using a cheaper tag stock. Unlike the continuous and snapout forms manufacturers, who usually furnish you with the most inexpensive quality of paper to suit your needs, the tag makers often sell you a tough glazed stock that is more expensive than the grade you need to do the job. Most tags are used for such short periods that extreme durability is not needed, therefore a cheaper tag stock is adequate. Price breaks on tags usually come at the 10,000 and 25,000 marks, so check your usage to see if it won't be more economical to order the larger quantity.

To reduce the cost of forms used in very large quantities it is worth while to enlist the aid of the salesmen who are interested in getting the next order. In one instance, a 2-part continuous tab form was being used at the rate of about 800,000 sets a year. By needling the forms salesmen to find a cheaper way to produce this form we finally got the price down about 25% by changing the construction and reducing the size slightly.

A significant factor in the above revision was a reduction of the depth of the form from 4″ to 3½″. The latter can be printed on a 14″ cylinder press whereas the former required a 16″ cylinder press which was not as readily available and was more expensive to set-up and run. Every forms control man should be familiar with rotary press cylinder sizes for producing continuous forms. By sticking to the more common measurements you will find more supply sources and get cheaper prices and faster deliveries.

Along with watching out for fancy sizes, also watch out for fancy constructions. The latter have their place when it is desirable at one writing to produce a welter of forms of various sizes and shapes, each carrying all or part of the information being recorded. But whenever I see one of these forms I can't help wondering whether a little advance systems work wouldn't have eliminated most of the disparate sizes and a few of the numerous parts.

Here are two final hints which may not save your company any money but they should be of some help. First, don't ever show proofs of new or revised forms to anyone outside the forms control section. Always insist that the using departments submit a definitive design or approve copy prepared by you before it goes to the printer. Convince them that they have to settle down to a final decision as to how they want the form before you order it. After that it's your responsibility to see that the printer produces forms that meet the design and specifications that have been approved. Sometimes it's a big responsibility, especially when the cost runs into several thousand dollars, don't ever weaken it by sharing it with other departments.

Last but not least, make your forms attractive. Don't be satisfied with a purely functional design that is totally lacking in aesthetic qualities. People have to look at these forms all day, and it's better for their dispositions and their efficiency if they are looking at attractive designs and colors. How can you tell whether a form is attractive? If you don't trust yourself, look in the GPO Style Manual or elsewhere at some of the older government forms—this will show you some of the things to avoid. Then glance through forms from other companies, pick out those which impress your eye favorably, and compare them with less attractive forms until you learn to pick out the differences in format, type faces, spacing, columns, margins, arrangement of information, etc., which make one form more pleasing in appearance than another. Remember that an attractive form costs no more to print than a repulsive one—it only takes a little more care to design.

by Thomas G. Rizzo

ELECTRONICS FOR MANAGEMENT

What is a computer? How does it operate? What can it do? For competitive reasons, business organizations need the answers to these questions in order to have the full facts about electronic data processing. Efforts will be made to answer these questions in a series of articles starting with this issue.

The articles will include an explanation and analysis covering the general application of medium sized computers, i.e., the Remington Rand Univac File Computer, the I.B.M. 650, the Datatron, etc.

Mr. Rizzo is a systems analyst with American Smelting and Refining Company, specializing in computer and electronic device planning. In recent years he has devoted full time to extensive research and analysis of electronic data-processing machines and their applications.

► The Univac File Computer is a medium sized electronic computer system designed to combine electronic computing with large capacity internal magnetic-drum storage for random access processing of unsorted data. It possesses common language versatility. Input-output units and storage units can be put together as building block units to produce a system satisfying individual requirements. The five basic components of any computer system are input, storage, arithmetic, control and output. In the Univac File Computer the number and capacity of these units in any grouping of equipment are determined by the individual application requirements.

Expanding management requirements for better control of the basic business functions have dictated the need for computers with larger and larger internal storage systems. Careful analysis has determined that this storage should possess a format for storing data similar to the form of the business transaction. This basic form is the individual unit record which is an extension of that common to punched card systems. For example in payroll we are concerned with the employee, while inventory control

Continued

problems require the handling of single items, successively. Sales analysis, material control, billing and invoicing, and virtually every other business problem deal with individual unit records. This format then, has been adopted as the layout for storing data within the system. This layout, together with the user's ability to specify the desired length of the record, allows maximum utility of the large storage capacity available in the Univac File Computer.

Instant Reference

The large-scale random-access internal memory permits instant reference to stored unit records which include all the control figures and master data required for the complete processing of each input item.

This random-access storage feature permits entry of the input data to the system in the random sequence of its arrival. It can, thus, eliminate the need for batch processing, saving the usual delays as well as the machine steps of sorting and merging input data, then re-sorting output data.

On the other hand, the Univac File Computer can also handle the complete task of batch processing when so programmed. By means of magnetic tape, magnetic drum or punched card methods, input data and stored unit records can be sequenced and merged as needed for purposes.

It is possible with this computer to perform the simultaneous operation of up to 31 universal language input-output units, i.e., any combination of punched-card, magnetic tape, perforated tape, line printer, electric typewriter, ten-key tape printer, and key punch units. This flexibility opens the way for practically unlimited innovations of procedures to solve particular problems of data processing and reference to sorted data. In particular, it permits a direct tie-in with automated recording of the transaction item to be used as input data, and with automated methods for utilizing output data from the system.

Processing of each input item can include many computations and logical decisions based on simultaneous reference to both the input data and the stored data (balances, to-date totals, rates or prices, etc.). Output of results can be made immediately, including stored master descriptions, etc. As part of the same processing, all stored balances and totals can be brought forward to reflect the item processed such as maintaining complete control figures on a truly current basis. Several applications can be combined into a single high-speed processing. For example, billing can be combined with inventory control and sales statistics requiring only a single processing run of each customer order. Similarly, a production control system that includes both machine loads and operation schedules requires only a single processing for each work order and each job ticket. Complex mathematical problems can be completed in a single pass of a punched card deck. The combination of multiple input and expandable programming capacity permits the simultaneous processing of many different types of data —with each input item processed, selectively, according to its own requirements.

All the data held in random-access storage is instantly available by keyboard inquiry, when needed,—eliminating any need to search records or wait until records are available. From storage, condensed management and operating reports may be read out, selectively and with necessary calculations. Another capability of the system is the immediate reporting through proper programming of any condition requiring supervisory attention, at the instant such a condition develops during normal data-processing runs. Such reports can be printed out directly on an input-output unit located in the supervisory office concerned, and keyboard inquiry can also be made, directly, from that office for any stored information required.

The wide choice of input-output and storage units permits the designing of a system tailored specifically for the particular data-processing needs. Additional units may be added to the system at any time to meet expansion requirements.

The Univac File Computer, as all computers, can be analyzed by functions which are:

Input, Output, Storage, Arithmetic and Control.

All computers require components of one form or another to accomplish these five functions.

The types of input and output devices available with the Univac Computer are:

1. 90 Column card sensing punching unit –150 CPM
2. 90 Column card sensing punching unit –200 CPM
3. 80 Column card sensing punching unit –200 CPM
4. Inquiry Keyboard
5. Typewriter with paper tape and plugboard format control
6. Paper tape reader–200 characters per second
7. Paper tape punch–60 characters per second
8. Key Punch–90 Column
9. Magnetic Tape–Plastic
10. Magnetic Tape–Metallic
11. High Speed Printer

Any combination of these devices in any total number from one to thirty-one may be included in any one Univac File Computer system. Since each device is equipped with its own buffer storage, multiple device systems can share the computer through direction of the multiplex function.

There are five basic storage sections within the Univac File Computer. One is composed of magnetic cores, while the remaining four types are magnetic drum storages. The five storage sections and their respective access speeds and capacities are:

Management acceptance of electronic data processing machines must primarily be based on economic justification. Since the majority of business firms today cannot economically justify large-scale electronic computers, the medium-sized computer, rather than the "giant computer", is likely to form the nucleus for wide application of electronic data processing machines to business problems.

1. **Input-Output Buffer Storages**–*Magnetic Cores*

These storages act as a translator medium between the input-output device and the computer input-output drum track for the device. The storage may be dependent on the device of either 12 or 120 digit capacity. However, even if the buffer is of 12 digit capacity, it can handle up to 120 digits by repeated transfers.

2. **Input Drum Storages**–*Magnetic Drum 12,000 RPM*

These storages are used by the computer for obtaining input data from, and delivering output data to the input-output buffer storages. There are 10 storages of twelve digit capacity each, for every input-output device included in the system. The average access time to any input storage is 2.5 milliseconds.

3. **Intermediate Storages**–*Magnetic Drum 12,000 RPM*

This storage section is used to retain constant or intermediate computing results. Either thirty or fifty of these twelve digit storages may be included in a system. Average access to any storage is 2.5 milliseconds.

4. **Program Storage**–*Magnetic Drum 12,000 RPM*

For additional program capacity (over and

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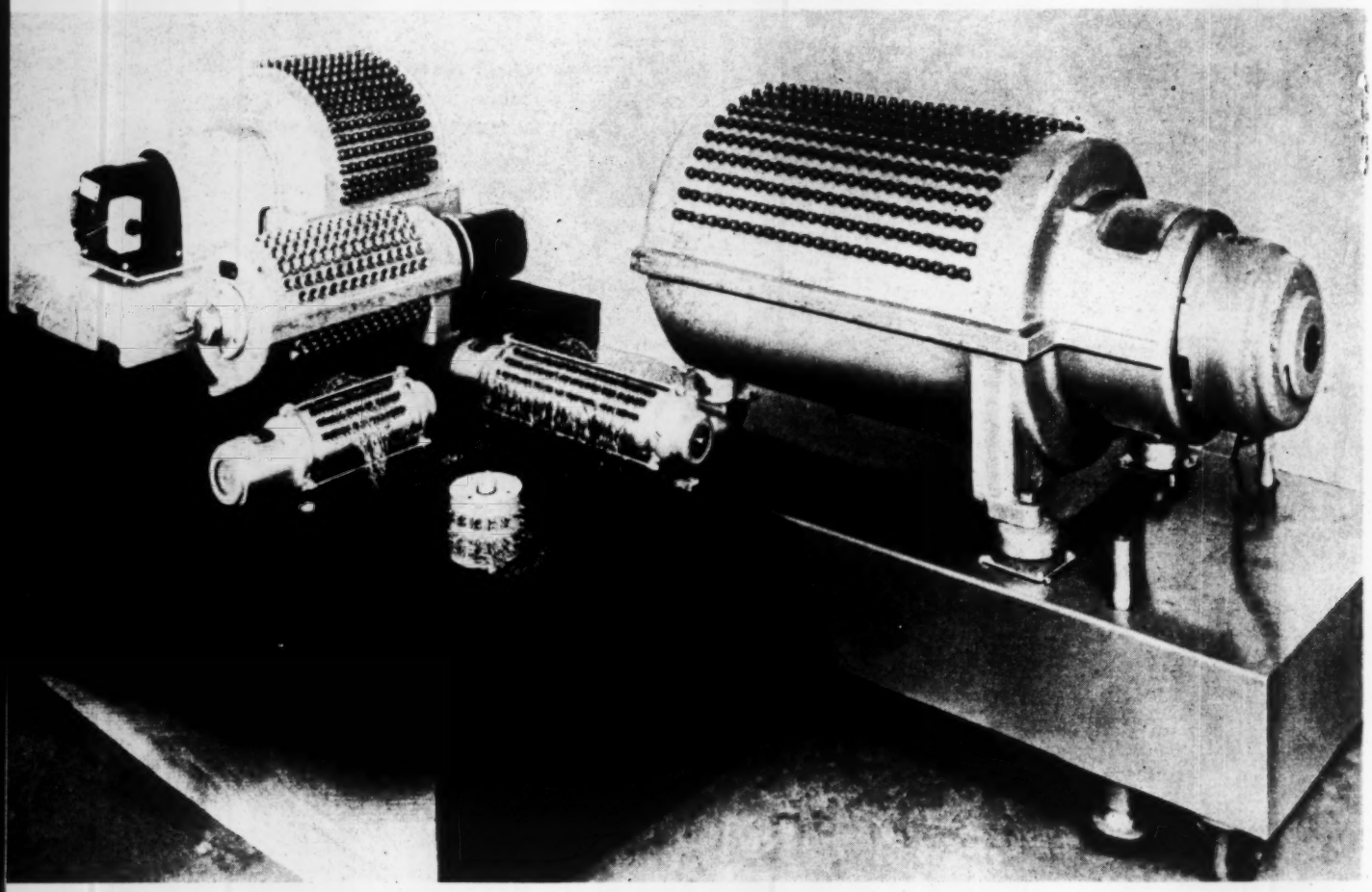


The new Univac file-computer combines electronic computing with magnetic drum filing.

above the plugboard), additional storages may be included in a system. These storages may be used to store either three address program instructions, results, or constant data. Average access time to any of these storages is 2.5 milliseconds.

5. Large Capacity Storage—*Magnetic Drums 1,750 RPM*

Large capacity drum storage is used for storing file reference data, summarized results, or volatile file data. Each unit or drum can store up to 180,000 characters of data, and a total of ten drums can be included in one system to obtain a total of 1,800,000 characters of storage. The average access time to any set of characters in this storage section is 17 milliseconds.

External storage in the form of magnetic tapes or cards is also available.

The Arithmetic section of the machine provides the necessary circuitry to perform the data processing functions upon the stored information. The functions provided for are:

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Comparison—Alphabetic and/or numeric
6. Transfer of data—Alphabetic and/or numeric
7. Left Zero Elimination—an editing function

8. Channel Search—an automatic sequential search of the large capacity drums for desired data.

9. Result sign determination and branching (+, −, 0)

The control section of the machine provides the means of linking and directing these processes of the arithmetic section to operate in a logical, pre-determined manner upon the stored data.

1. External Programming: Control Panel of 48 non-sequential reusable three address steps.

Continued

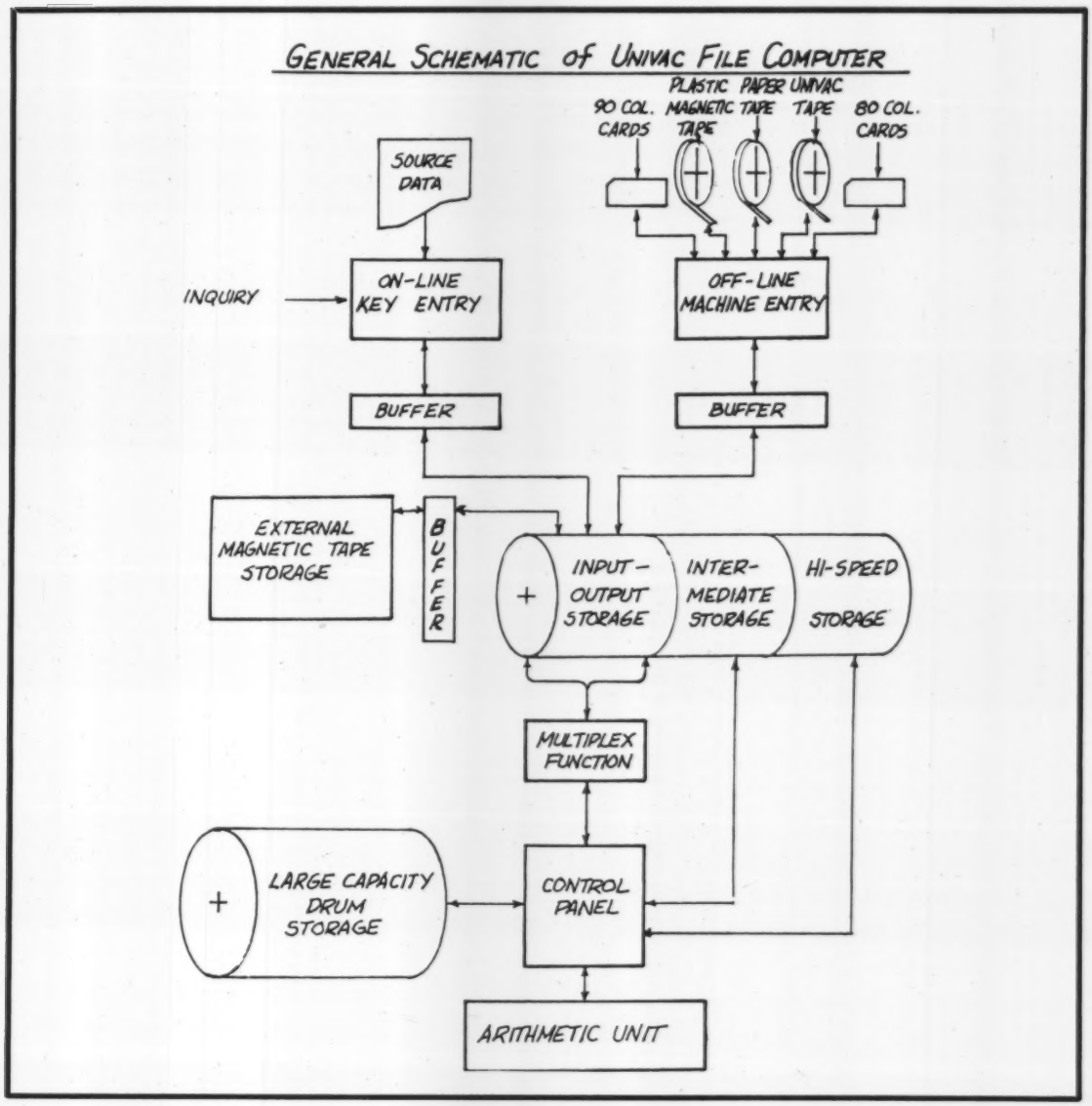


FIGURE 1

Illustration of the general flow of data within a complete system utilizing the major components of the computer.

Continued

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H
0	x												x	x	x			
1		x	x								x	x				x		
3				x	x									x	x			x
5						x	x				x	x		x			x	
7								x	x				x			x	x	x
9			x		x		x		x	x	x					x		

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	%
0				x	x	x							x	x	x	x			x
1		x					x	x		x	x						x		x
3	x	x	x				x	x	x			x		x	x		x		
5	x	x	x		x	x			x		x		x					x	
7								x	x	x	x	x	x		x	x		x	
9			x	x		x						x		x		x	x	x	

Punching Codes

2. Internal Programming: Stored instructions from hi-speed drum to provide additional three address steps.

Both of these means of control can be utilized in any one system. See Figure 1.

Operational characteristics of all the various input-output devices which may be included in a Univac File Computer system are:

The 90 Column Card Sensing Punching Unit–150 CPM

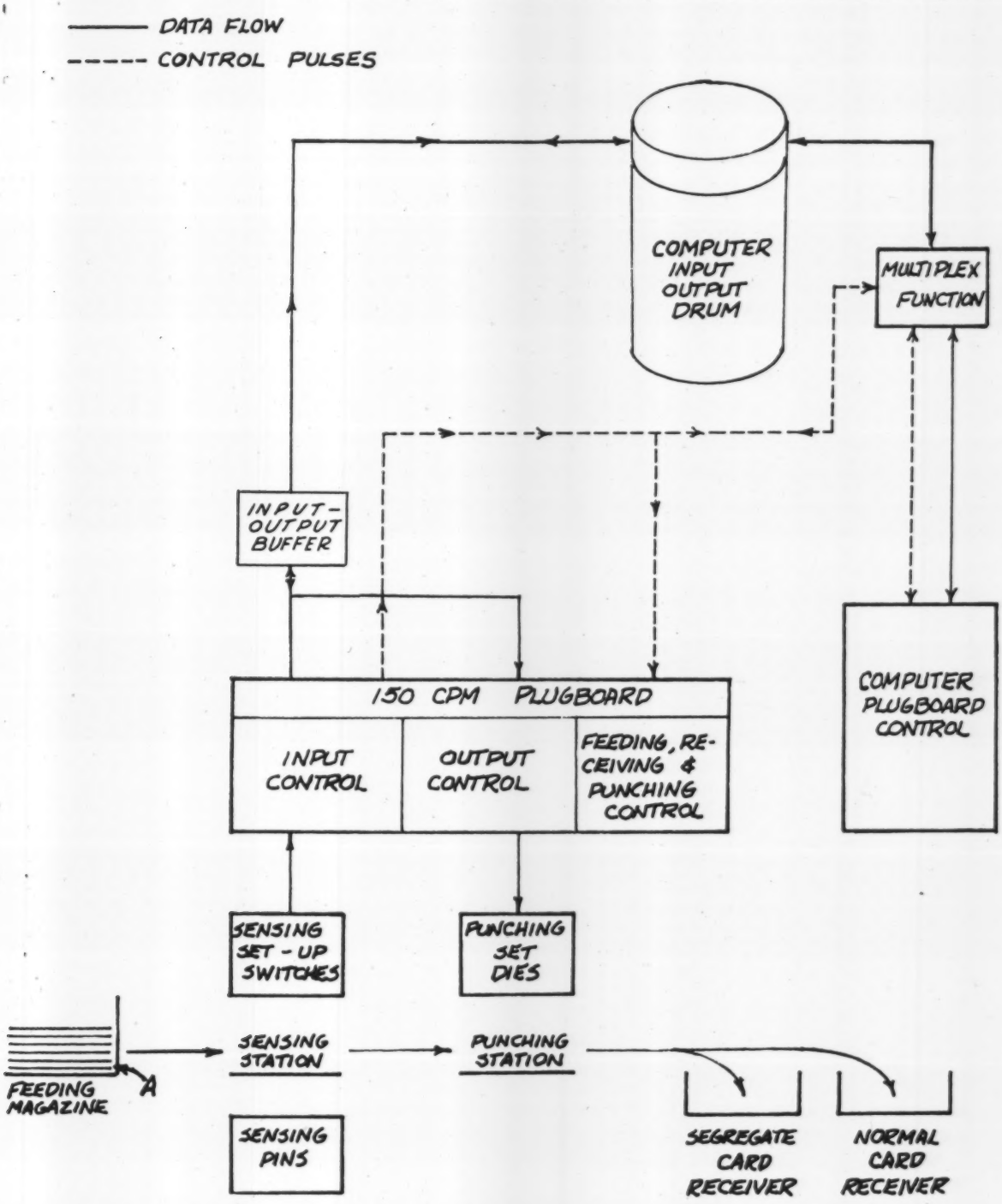
1. Input-Output Media: Ninety column punched cards, each column containing six punching positions i.e. (0, 1, 3, 5, 7, 9,). The punching codes are shown above.

The diagram opposite shows the detail data and control flow between the 150 CPM unit and the Computer. To illustrate this matter more clearly, trace the data flow and card feeding operations of Card A. in figure 2.

By raising the manual Card Feed Switch of the computer:

1. Card A enters the card sensing station.
2. The sensing pins rise and set-up the sensing switches related to the positions punched in Card A.
3. Information punched in Card A is now available on the input plugboard and through input wiring may begin to be transferred into the buffer core storage and then into the input drum storages.
4. The sensing pins drop.
5. Card A moves to the punch station.
6. The device signals the Computer that Card A's input is ready to be processed.
7. The next card in the feeding magazine moves to the sensing station.
8. The Computer has been calculating Card A's data and delivering the output results to the output drum storages. During this time, Card A remains at the punching station.
9. On completion of the program, a "TRIP" signal will be delivered to the input-output plugboard through an output control line from the Computer. This trip signal activates the following events in sequence.
   a. All drum output storages to be

FIGURE 2. Diagram of detail data and control flow between the 150 CPM unit and the computer.



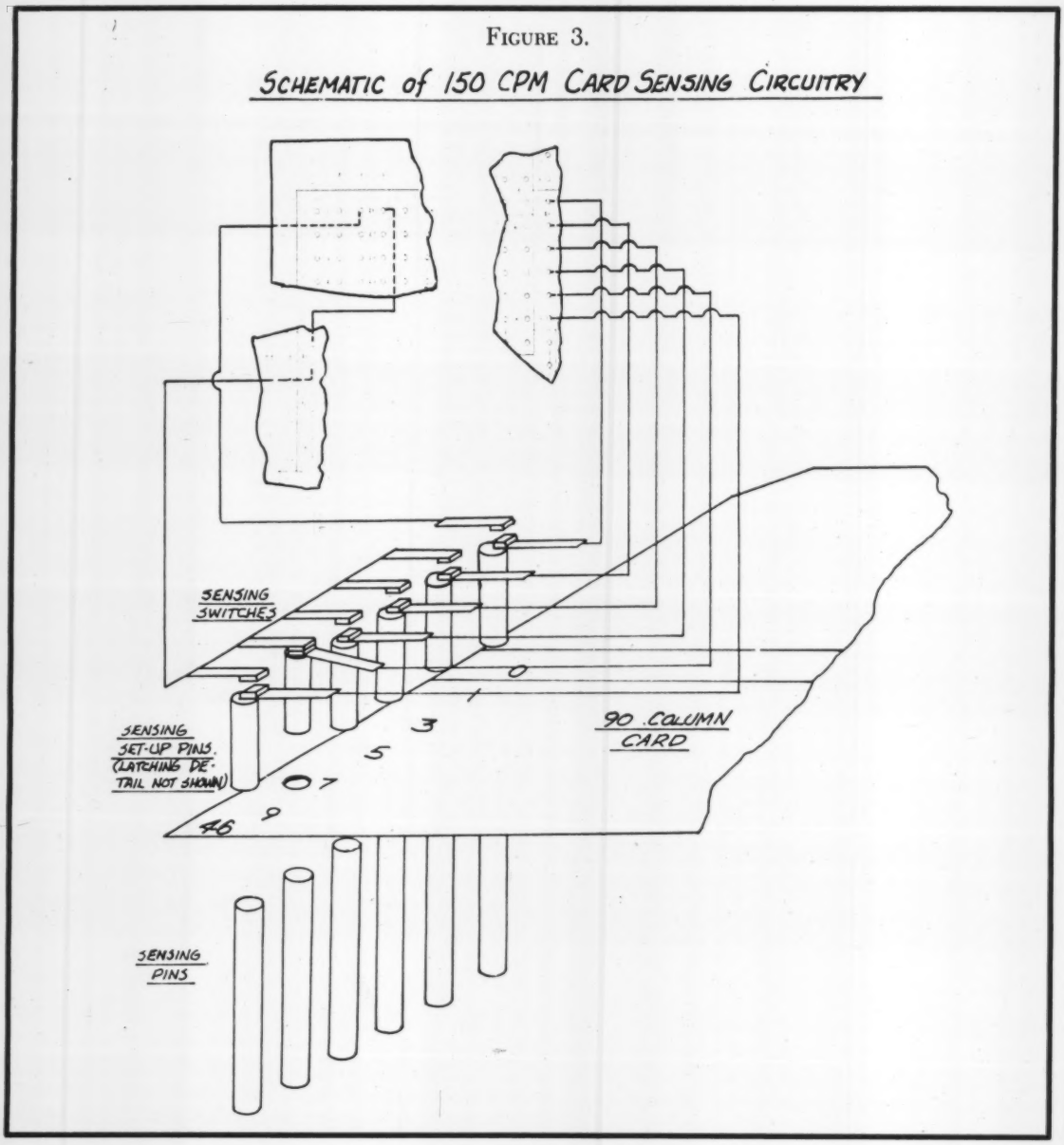
punched in the card are delivered (through the input-output plugboards control) to the desired set dies and the dies are set for punching.

b. The punching set dies descend and the dies which were set in (a) perforate their positions in card A.

As can be seen from the above example the functions available on the input-output control board are utilized during the following steps:

1. Determination of what card columns go to which input storage units.
2. Wiring of the trip signal from an output control line.
3. Determination of what card columns are to be punched from which output storage units.

FIGURE 3.



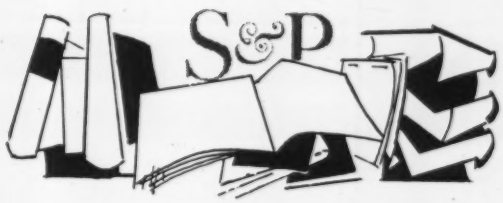
These three points are the major considerations in wiring the plugboard and are treated individually in the following detailed discussion of the input-output plugboard. The major areas of the plugboard are explained from a functional standpoint and examples of wiring are included for the various uses of the plugboard hubs.

In the case shown in Figure 3 the following operations occur:

1. The card entered the sensing station.
2. The sensing pins rose, the seven (7) pin passed through the hole in the card and pushed the sensing set-up pin seven (7) into a latched position. This also closed the seven position sensing switch. All other sensing pins (0, 1, 3, 5 and 9) were stopped by the card and therefore did not activate their sensing set-up pins.
3. The sensing pins dropped (returned to normal), however the seven (7) sensing set-up pin remains latched thus keeping the seven (7) closed. The seven (7) sensing switch will remain closed until the device receives a "TRIP" signal which un-latches the set-up pin allowing it to drop. This breaks the seven (7) sensing switch connection.

As can be seen from the diagram, any current entering the card sensing common will be received at the card sensing positions related to the positions punched in the card. Note that if any current is to be received at the zero (0) position the originating current must enter the O/C hub of the zero sensing commons. This separation of the zero switch from the 1, 3, 5, 7, and 9 switches allows us to use zero's over numeric fields as control positions while still allowing the use of the other positions in the column as normal input data. Of course if the column being wired contains alphabetic data, then the "O/C hub" should be wired to the "C hub" thus connecting the zero position to the common in the same manner as the other positions.

(*To be continued in next issue*)



Worth Reading

"Choose the Computer the Company Needs"

Monroe M. Koontz, NACA BULLETIN, July, 1956

Describes the factors which were considered by Inland Steel in their selection of a computer. Principally, they were guided by a desire to make an installation pay its way reasonably soon by placing an incentive payroll system on the computer.

"How One Company Reduced Cost of Processing Customers' Orders"

Robert O. Eberbach, OFFICE EXECUTIVE, July 1956

Detailed description of a 50 employee laboratory supply company's system for order-invoicing. Forty thousand items are sold to 4000 accounts. About 20% of the orders involve back orders. Flexowriters, billing machines and punched cards are used.

"Plan Your Computer Installation for Maximum Advantage"

T. V. Learson, NACA BULLETIN, July 1956

The author briefly explains six cautions about EDPM work based on his experience as a Sales Vice President for IBM:

1. Don't convert manual methods directly to electronic method.
2. Don't transfer tabulating procedures without revision.
3. Have experienced methods men review programs.

Continued

4. A single team should oversee all conversion steps.

5. Rare exceptions should not be handled electronically.

6. Select a computer staff with care.

"Automation in the Office"
OFFICE MANAGEMENT, June 1956
Brief two part article describing EDPM applications by Pan American Airways and the Grace Line. Pan Am is using an IBM 705 to prepare a daily report of traffic averaging 7000 waybills. The report presents the following data:

Pan Am Division, Commodity Type, Sales Area, Origin and Destination, and Revenue.

Grace Line is using an IBM 607 calculator and storage unit for a billing system which eliminates manual computation of shipping charges, transfer of data to a due bill, and development of related statistics. Pre-punched cards for commodities and shippers are used. Use of the system makes it possible to have a detailed cargo analysis available immediately after loading.

"Teaming Computers and Operations Research"
Morley G. Melden, FACTORY MANAGEMENT AND MAINTENANCE, April 1956
Case study of an IBM 701 computer application involving a shipping distribution problem faced by General Foods.

"Making a Computer Pay"
H. N. Laden, PAPERWORK SIMPLIFICATION, Second Quarter 1956
Detailed description of Chesapeake & Ohio Railroad's experience with Univac. Describes the groups established to explore feasibility, orient personnel and install the computer. Covers technical steps in readying a program for the computer.

Continued on Page 33

Systems is a profession;

Don't sell yourself short!

No Detours

►During the decade plus since the end of World War II, American industry generally has taken tremendous forward strides. It can almost be said that this is true in spite of the resistance to change which characterizes a large segment of management "old hands"! But there were a variety of economic pressures in that period which had the salutary effect of bringing about sometimes "agonizing" reappraisals of how management managed!

Those reappraisals brought home the need for cutting costs in areas not sacrosanct to the workingman. Management was not in a position to reduce direct labor costs and they were helpless in a competitive market to purchase materials at any great savings. Yet it was absolutely necessary to find a means to increase profits! The rueful discovery that the only avenue of relief led right to the door of management itself was made many, many times! Again and again there was posed the question: *"How does management manage"?* The answer was always quite clear: "Management manages

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by John H. Burns

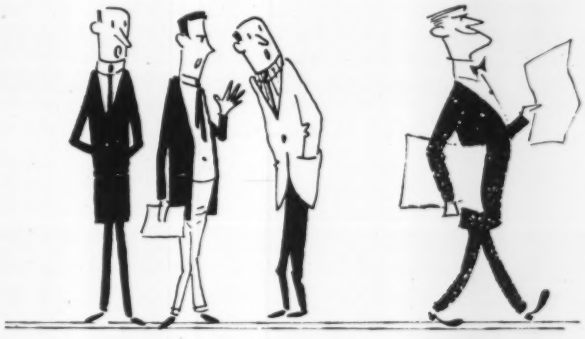
Around "Mr. Samson"

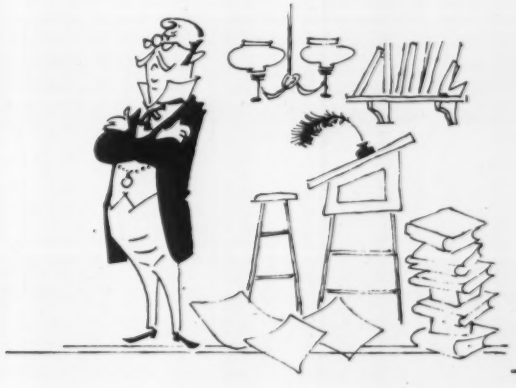
through established systems and procedures." This is true in every case, because while we might accuse some concerns of "having no system," the very existence of "the-seat-of-the-pants" manager was the existence of a system!

Of course the progressive, dynamic firms didn't hesitate to recruit systems and procedures analysts-to-be out of the ranks of production control, accounting and industrial engineering departments. They were soon nurturing lusty systems and procedures departments to enhance the profit picture in areas never before considered important to profit!

Then there were, and we might add, still are, those firms where "progress" not only is *not* "the most important product" but where progress is regarded as tantamount to treason! Today in many such stultified firms, the systems man patiently studies, analyzes, recommends and then seeks agreement. He seeks acceptance of *proven* new methods or machines adapted to his company's unique requirements. He is interested in the long range view which shows a handsome return for the investment involved. He has been trained and urged to exert every effort to "gain acceptance"—"to sell the idea"; he has learned patience the hard way. Finally with an installation in and humming along, management, together with department heads and the employees concerned, find new uses for the systems man's talent! He has gradually brought his chosen field to a professional status. He has demonstrated in thousands upon thousands of instances that the correct system or procedure has a direct and beneficial effect on profit. He has brought about a favorable change in the attitude of most management to his work.

Regrettably, such change in attitude, where it does take place, does not always seep far enough into the organizational roots to do any more than barely sustain the systems analyst! The management of an enterprise has a well-defined obligation





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to give backing and latitude to the analyst if they wish to capitalize to the fullest on his fund of knowledge and imagination! "There are too many cases, in which a systems analyst is employed to do 'the best you can' with old Mr. Samson. He's a long time employee and we don't want to make any changes which will upset him." And so Mr. Samson, like a Colossus barring the way, complacently folds his arms and says "over my dead body" . . . and no one in management has the courage to back up the analyst!

This lack of courage stems both from a lack of conviction and the always present fear that a decision could be incorrect! But when the systems man maneuvers around one obstacle after another (mostly human) to get himself finally in *a position* to do some effective work, that conviction develops rapidly as the results begin to show! And when management backs S & P personnel properly—the results come more quickly! There are no detours around the "Mr. Samsons!"

There is a risk inherent in this new found confidence in the systems man: It is the two-fold risk of complacency within himself and that of being "typed" or catalogued by management as "specialists" in paperwork or some other area peculiar to the overall systems field. The systems analyst must always be alert to avoid such pitfalls and maintain and develop his stature within the top echelons of management, being careful at the same time never to transgress the executive prerogatives.

It should no longer be necessary for the systems man to await an opportunity to "sell" his employer on the basic concepts of our profession. This is not to say that we can dispense with "gaining acceptance" for our ideas, but, if the employer does not *want* systems and procedures now—the wise analyst will move along. Too many aggressive managements want and need the professional help of systems men!

What are the factors to consider when you select office equipment?

Checklist for

One of the intriguing elements in methods work is to observe several firms with almost identical equipment problems, or methods problems requiring the adoption of equipment, and then to note the diversity of solutions arrived at. Why is this so? Are there really underlying differences in the problems which only seem superficially to be identical? Or is it simply because in one case a decision may reflect company policy, or a preference by some office manager for a particular type of equipment? Or because the use of some piece of equipment was poorly planned in the past, so that the experience influences present policy? Or because a strong sales presentation was made for one type of machine to the exclusion of others?

As one of its assignments this past year, the Research Committee of the Knickerbocker Chapter turned its attention to the problems involved in selecting office equip-

Elmer V. Grillo has been active in the Knickerbocker Chapter, first as a member of the Research Committee where he developed this checklist, and currently as Program Chairman. A graduate of Brown University and Harvard Business School, he has been employed for the past nine years in office methods work.

by Elmer V. Grillo

Replacing Equipment

ment. A worthwhile approach seemed to be to develop a checklist of the considerations involved in making an equipment decision for a major systems installation or revision. It was decided to exclude more limited problems from the scope of the checklist—such as, for example, when to add one or two more typewriters or calculating machines for increased work volumes; or considerations of specific office equipment such as duplicating or transcription, for example. Furthermore, no evaluation was attempted of some of the formulae advanced of late for solving replacement problems.

The bibliography at the end has been included not only for reference but as a means of acknowledging the contributions to the thinking that went into the checklist.

I. Costs

A. One-time costs

1. What do we do about installation and developmental costs, such as methods department salaries
   a. Charge off against first year
   b. Capitalize and amortize over the life of the equipment
2. What do we do about
   a. training costs of new system
   b. additional help and overtime
   c. value of equipment, supplies and forms made obsolete
   d. maintaining a dual system over a period of time

Continued

e. cost of training personnel for other jobs in company made obsolete by the new system
f. creation of surplus people or employee time (especially if it is not company policy to fire people made surplus by methods changes but to depend upon attrition)

B. Computation of Recurring Costs
1. Direct labor charges
a. Include salaries only OR
b. Add a percentage for "fringe benefits"
c. What figure do you take for salaries
1. actual salaries paid or to be paid
2. maximum salaries for the various positions
3. a stated percent of maximum salaries
2. Overhead
a. Is there really a savings proportional to the savings in direct labor
b. Will overhead savings or reductions actually be realized, or does something else bear the "shifted" burden
c. Is the same true of alleged savings in rent and light
d. Should we make the new installation bear the full overhead costs even though other applications are in the offing to absorb some of the burden later

C. Interest on investment
1. Do you consider it or not
a. Not unless you actually go out and borrow the money
b. Yes
2. If yes, do you:
a. Use the rate for borrowed money on the current market
b. Use a nominal rate such as 6 percent
c. Use the rate obtainable from alternate investment
d. Add a factor for risk or a safety margin
3. Average interest:
a. Avoid error of assuming a constant investment or loan of money, since it is paid back or amortized.

D. Value of present equipment
1. Do you use book value or current salvage value of present equipment
a. Most authorities favor current salvage value as being the sum the company realistically foregoes realizing if they keep the present equipment
2. Do you ignore sunk costs
a. Most say yes

E. Handling of depreciation
1. Straight line depreciation
a. Preferred by most since it is primarily a means of accounting for the cost of capital, and estimated life is a guess; therefore any refinement in calculations is not appropriate.
2. Percentage of use method
a. If so, do you make realistic assumptions as to volume.
3. Declining balance method
a. More depreciation in early years, to reflect the real greater value of the equipment when new
b. But means high cost estimates and lower profit showing in early years
4. Should we take into account the disposition made of replaced equipment, i.e., the scrap value realized

F. Should there be a payback period for realizing return
1. Definite period for all equipment, e.g., five years or two years
2. Is this "rule of thumb" enough
3. Or unrealistic in protecting old equipment because of the demands of a

definite payback period which may be too short
4. Or unrealistic in encouraging too early replacement if we assume too long a payback period
5. Should we ignore the entire payback approach and rely upon the formula of the Machinery and Allied Products Institute (MAPI)

II. Employee Factors

A. How do we estimate labor time under new and old system
1. use of work measurement standards
2. use of predetermined time standards
3. past experience
4. estimates of salesmen offering equipment

B. Morale
1. Will clerical force resent the new system and consciously or unconsciously resist it and slow it down
2. Or are there plus factors in the new equipment such as elimination of noise and dirt

C. Will there be differences in the compensation of people under the new and old method
1. Will more skilled and therefore higher grade labor be needed
2. Will you be able to utilize the displaced people in necessary work elsewhere
3. Will this be at the grade or rate of compensation normally called for
4. If not, how long will it be before the savings can be expected to be realized

D. Are trained operators available in sufficient quality and quantity

III. Savings follow up

A. How do you follow up to make sure that savings are being maintained
1. Check operators to see that speed is maintained and work patterns remain as planned
2. Use work measurement as an index of performance or comparison of actual with planned output

B. Should partial reductions in manpower be considered and followed up
1. Some say not unless the time made free can be effectively used elsewhere and close follow up or attention can be paid to it

C. Who takes credit for savings and the follow up
1. methods department
2. operating department
3. others who participated

IV. What are the adverse effects of not replacing

A. Higher operating costs
B. Lower quality
C. Poorer service to customers
D. Forsaking of additional volume
E. Slowing up of long range plans

V. Flexibility

A. Can the new equipment be used for other purposes if changes in the organization eliminate the need for the new method
1. Are there possible alternate uses

B. Will the necessary volume be maintained to realize the operating cost advantages of the new equipment
1. What would happen if the volume should drop considerably
2. Could costs be cut readily
3. How likely is this to happen

C. Can peak loads be handled effectively

VI. Rental versus Purchase

A. Should the company consider leasing its equipment, thus eliminating many of the problems discussed
1. No maintenance charges
2. Avoid initial investment of capital
3. Most of cost of equipment charged off in early years under most leasing arrangements

B. Net cost of equipment over a period of time may be greater if leased

C. Tax considerations
1. Of less importance since the liberalization in the depreciation methods accepted by the Government

Continued

VII. Pitfalls to Avoid

A. Do the exceptions nullify the effectiveness of the new method, and if so, what effect do they have on cost?
B. What marginal jobs are being included to help meet payout requirements for the equipment? Are these jobs sound applications of the equipment?
C. Is there a real need for the statistics or reports available from the new equipment?
D. Will the new equipment handle peak and abnormal conditions?
E. Must stand-by equipment be provided?
F. Are we assuming unrealistic rates of efficiency or effectiveness of the new equipment?
G. Are we comparing the new equipment with a present method which is as efficient as it might be?
H. Will all the old methods and manual operations be really replaced as claimed?
I. Are we assuming a realistic volume of future work to keep the equipment busy?

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J. Are you attributing advantages or savings to the new equipment which could be realized without it?
K. Have we assumed practical, realistic operating speeds for the equipment?
L. Are we overestimating the service life of the equipment?
M. Are we layering the new system on top of one it is supposed to replace?
N. Will more advantageous equipment appear on the horizon in the foreseeable future?
O. Can the present equipment be overhauled? If so, how long will it last?

Here's an idea that worked!

In our company all outside telephone calls are charged back to the department making the call and appear in the monthly departmental budget. Originally the company operators were instructed to ask the "Bell" Operators for charges and these were recorded on the consecutively numbered charge tickets which then went through IBM and were distributed to the correct department. This always resulted in a high unallocated amount to be *spread* at the end of each month, representing tickets on which someone had forgotten to get the charges from the "Bell" operator.

To go one step from there, it was agreed with the "Bell" Company that they would accept a serial number with each long distance call placed. At the end of the month we would punch our telephone records by serial number and department number. Then we would receive from "Bell" their charge slips and punch serial number and amount. These two serial numbers were matched on a collator and we ended up with total amount charged per department per month.

This was fine until the pinch started to cause us to look more closely at the tabulating operation. Everytime we did anything we asked "Why." When we asked "Why" to this procedure the answer was so simple we wanted to kick ourselves. All that was necessary was to give the "Bell" Operator the department number instead of serial number. At the end of the month just punch up the "Bell" tickets and you have your answer. This simple question "Why" cut our tabulating time 68% per month on the telephone charge spread. This 68% came at a very crucial time during the month-end closing when every minute saved was not a minute earned but a minute and a half or two minutes earned because this particular job was always run on overtime.

Too often we get lost in the maze of "Integrated Data Processing," Electronic Data Processing" or "Work Measurement Standards" and lose sight of the easy savings directly under the nose.

—BY WALTER F. MYERS, B.T.E., *Accounting Services Manager, Kaiser Metal Products, Inc., Bristol, Pa.*

"Are systems complicated?" WHILE OTHER "APPROACHES" TO ADMINISTRATIVE PROBLEMS MAY SEEM COMPLICATED, THE "SYSTEMS APPROACH" IS BOTH SIMPLE AND DIRECT.

by Leslie Matthies

The systems approach is summarized in the picture. The man-at-the-top issues orders to do something. He usually uses paper, and we call this "action paper."

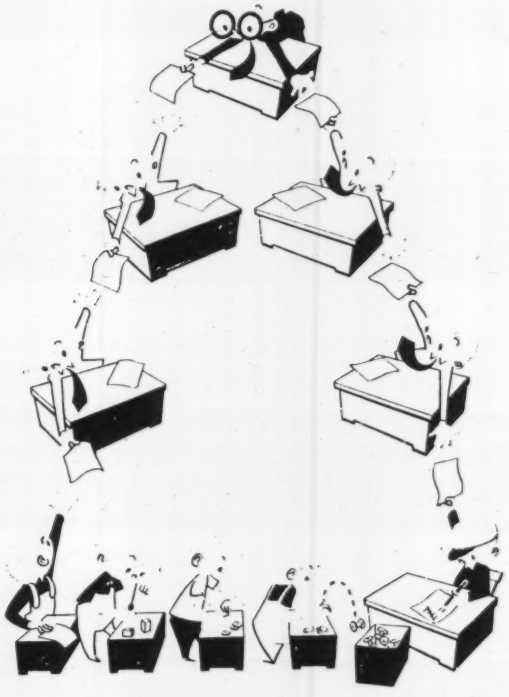
At certain key points in the flow, the system provides control points. Here somebody tallies what has happened.

Paper used at these control points is "record paper." Paper, however, is not essential. You can use an electronic or memory drum device. Anything goes as long as it will store information.

The record paper next furnishes the information for the reports part of the system.

It is this report that tells the boss: "That which you *ordered done,* has now *been done.*"

Basically that's all there is to a good system. It calls for action, provides for control, and reports back on the completed action.



Book Reviews

Automatic Data Processing Service, *by John Diebold & Associates, ($480.00 per one-year subscription), available from the publisher, Cudahy Publishing Company, 6141 North Cicero Ave., Chicago 30, Illinois.*

This new service edited by John Diebold & Associates, a leading consultant in the automation field, is designed to provide its subscribers, from one source and in an integrated format, comprehensive, accurate and objectively appraised information on all aspects of the digital computer field.

Automatic Data Processing, the first service of its kind, is presented in six types of reports as follows: Equipment Reports containing up-to-date detailed descriptions and evaluations of available "ADP" equipment; Methods Reports, case histories of electronics applications in various industries; Policy Reports analyzing managerial problems of equipment utilization; Newsletters, to notify management and operating personnel of new developments in the field; Orientation Materials intended to provide a basic program for the training of non-specialist personnel; and Special Reports and Index, the former to report on matters of special interest not in the above categories, and the latter to provide easy access to this great mass of information. In addition to the Index detailed filing instruction is supplied with the individual reports.

This unique service is extremely ambitious in purpose and scope. Its subject matter covers operating manuals for equipment, news of new installations, book reviews, equipment evaluations, and meeting notes to mention only a few of the topics treated. Unquestionably the high price for this service will prove to be a valuable investment for many companies with existing computer installations or functioning feasibility teams.

RICHARD W. POMEROY,
Fairbanks Associates, Greenwich, Conn.

Worth Reading

Continued from page 24

"Suggestions on Writing the Letter-type Report"
D. E. Henderson, NACA BULLETIN, July 1956

A concise practical treatment of the various aspects of report preparation. The author offers many examples to help a writer in the following ways:

1. Getting started
2. Connecting thoughts
3. Presenting a readable report

"One keyboard operation for order-intake, production, inventory"
Gordon K. Baker, MODERN OFFICE PROCEDURES, June 1956.

Describes Glidden Company's system for obtaining all data for shipping, billing, inventory control and sales reports from one typing of a customer's order. The system uses a Flexowriter, punched tape, and pre-punched cards.

"Electronic Computers for the Smaller Office"
Eugene J. Benge, THE OFFICE, March 1956.

Presents tables comparing features of available makes of calculating punches, numeric computers, and alphameric

Continued

computers of possible interest to companies with 200 or more employees.

"Cost Studies in Automation"
John L. Marley, AMERICAN BUSINESS, May 1956

Compares typical cost data of a punched card and an EDP system for companies of 1000, 2000, 4000, 5000 and 12,000 to determine where the breakeven point occurs. Costs are based upon personnel and equipment required for card origination, processing, and data output. Applications of the equipment are the same in each company: payroll, sales analysis and a wide range of general accounting. Concludes that cost of punched card and EDP are about equal in a company with 5000 employees.

"How Automatic Machines Can Simplify a System"
George J. Kelley and Kenneth A. McCarthy, THE OFFICE, July 1956.

Swank Inc. has decentralized the preparation of data to be fed to the tabulating department to such an extent that they hope to eliminate almost all key punching and verifying in that department. Punched tapes are prepared by operating departments. They claim the following advantages:

1. Responsibility is placed where it belongs
2. Accuracy will be improved
3. Tab work can be scheduled better
4. Savings will accrue from obtaining key punch data as a by-product of original work.

SPA national headquarters are now located in Detroit. Please send any communications concerning the association to 4463 Penobscot Bldg., Detroit.

An editorial

The Paperwork Revolution

"The judgment of history, it becomes increasingly clear, will depend in large measure upon how skillfully systems people employ the techniques of their trade and how persuasive their past and future successes are to practical managements. Like the industrial revolution whose impact was felt in factory management during the first part of the century, a paperwork revolution is inevitable in office management during the next decade, for technology applies to the office no less than to the plant." So wrote Mr. J. W. Haslett, first editor of the SYSTEMS AND PROCEDURES Magazine, in its initial issue in March 1950.

In approximately six years the paperwork revolution manifested by technological developments applicable to the office field has become a reality. The introduction of electronic equipment and integrated data processing will bring about a new era in office management. Within the next few years the principles and techniques of management must be revised to conform with the possibilities of electronic developments. Likewise office systems and procedures must be re-appraised and adjusted to fit the speed and scope of E.D.P.M. equipment being designed for paperwork processing.

Machines are only a tool in the hands of the master mechanic, or in our case, the systems man. But is the systems man ready for electronic development applicable to the office? Is he learning everything there is to know about such equipment? Is he capable of skillfully putting these tools to work? Only through complete understanding of new mechanical and electronic equipment will the systems man be able to put these tools to practical use in the office, and thus accomplish management objectives of lower operating costs and speedier processing of information which is essential to decision making.

Too often when a new tool is introduced, we look at it as a cure-all for our problems. The systems man cannot fall prey to the adoption of electronic equipment as the cure-all for management problems because he is concerned with the basic systems applicable to paperwork. Such devices do not constitute a system but only a tool that must be integrated in the overall procedure. On the other hand, this tool does permit us to perform operations in a manner considered impossible a decade ago.

Probably the most prominent example of this is the conversion of data from teletype equipment or a special typewriter to a punched tape, and from tabulating cards or punched tape to magnetic tape, and vice versa. This new technique has opened the door to the development of many new systems in paperwork processing. The systems man must show management that our profession is capable of handling this new tool and utilizing electronic equipment effectively. He is the man—the link between management and paperwork processing, and in this position he must skillfully apply new electronic developments that will make the paperwork revolution as obvious in a decade as the industrial revolution was in factory management.

THE EDITORS

The Philosophy of I D P

Continued from page 7

dwindle and we will rely most heavily on programming as and when required, out of our massive storage.

d. We will have integration of functions and departments with radical reductions in present compartmentalizations. Some departments will disappear entirely.

e. We will rapidly come to agreement that we must solve our communications problems first if we are to properly solve our electronic problems.

f. Punched cards will go out—as computer input, as computer output, as a usable medium.

g. We will be working largely from computational outputs of exceptions (from data reduction), and very, very little from reports and long tabulations.

h. We in the applications field will be placing our emphasis on direct costs last, not first.

i. We will more and more concentrate on the development of equipments to satisfy our desired goals rather than hunt for the best possible applications of existing equipments.

j. Five channel punched paper tapes will eventually displace all 6, 7 and 8 channel tapes.

k. We will gradually get away, in any single company, from the application of a wide variety of makes and types of mechanisms, finally standardizing on one for the communications and one for the electronic equipment.

l. And finally we will be discovering concepts of timing and accuracy that bear no resemblance to those of our past.

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How to Sell Systems to Management *by Robert Briggs*
Better Forms *by Gibbs Myers*
Electronics for Management *by Thomas G. Rizzo*
No Detours Around "Mr. Samson" *by Joseph H. Burns*
Checklist for Replacing Equipment *by Elmer V. Grillo*

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